	Student/Class Goal
# Operational Accuracy	In our daily lives, accuracy would be important in such activities as calculating pay checks, paying bills, taking prescription drugs, and construction projects.

Outcome (*lesson objective*) Students will improve accuracy in all four mathematical operations with an 85% or better.	**Time Frame** Two 1-hour classes

Standard *Use Math to Solve Problems and Communicate*	NRS EFL 6

Number Sense	Benchmarks	Geometry & Measurement	Benchmarks	Processes	Benchmarks
Words to numbers connection		Geometric figures		Word problems	
Calculation	6.1	Coordinate system		Problem solving strategies	6.27
Order of operations		Perimeter/area/volume formulas		Solutions analysis	
Compare/order numbers	6.3	Graphing two-dimensional figures		Calculator	
Estimation	6.4	Measurement relationships		Math terminology/symbols	
Exponents/radical expressions		Pythagorean theorem		Logical progression	
Algebra & Patterns	**Benchmarks**	Measurement applications	6.12	Contextual situations	
Patterns/sequences		Measurement conversions	6.13	Mathematical material	
Equations/expressions		Rounding	6.14	Logical terms	
Linear/nonlinear representations		**Data Analysis & Probability**	**Benchmarks**	Accuracy/precision	6.35
Graphing		Data interpretation		Real-life applications	6.36
Linear equations		Data displays construction		Independence/range/fluency	
Quadratic equations		Central tendency			
		Probabilities			
		Contextual probability			

Materials
Pencils, notebook paper, graph paper,
Operational Accuracy Worksheet
When is Accuracy Important? Worksheet
Introductory Decimal Accuracy Worksheet
Construction & Financial Situation Accuracy Handout
Operational Accuracy Test
Basic College Mathematics: Third Edition. Elayn Martin-Gay, 317-319, 107, 170, 244

Learner Prior Knowledge
Students should already be familiar with rules for calculating whole numbers, fractions, and decimals in four operations.

Instructional Activities
Step 1 - Place the following problems on the board or overhead and ask for answers from group.

a. 3 x 2 =   b. 3 x 1 =   c. 3 x 0 =

a. $\dfrac{6}{3} =$ b. $\dfrac{3}{3} =$ c. $\dfrac{0}{3} =$

Teacher will review multiplication and division problems involving one and zero, establishing that division by zero as undefined. Dividing something into two parts means separating a quantity into two groups. Dividing something into zero parts doesn't make sense, and

mathematicians describe division by zero as undefined. Therefore we would not write a problem like this $\dfrac{3}{0}$.

Step 2 - Students will write two problems where answer will be zero and two where the answer will be one; exchange papers and have students check one another's work.

Step 3 - Review rules for operations. Give students cancellation problem to complete; check for accurate answers; give students 3 mental math problems; check for accuracy of answers. Students can complete *Operational Accuracy* Worksheet either individually or in pairs.

Step 4 - How accurate were you with the answers you just found? What is accuracy and when might it be important? Accuracy comes from the Latin infinitive *accurare* which means to do with care. Accuracy would probably be important with your pay check, the bills, prescription drugs, and construction projects.   Teacher and students will analyze and discuss fraction problem, then work through additional problems on the *When is Accuracy Important?* Worksheet. For additional practice, students can work through the problems on pp. 317–319 of the textbook.

Homework from the textbook would include: p. 107, ex. 147 – 158, p. 170, ex. 41 – 50, and p. 244, ex. 8 – 17. These exercises are to be completed and checked for accuracy and understanding at the beginning of the next meeting of the class.

Step 5 - Give students *Introductory Decimal Accuracy* Worksheet; discuss answers when complete. Also, review assigned homework problems at this time. Work any incorrect problems on the board together, flushing out misunderstandings and correct learning.

Step 6 - Create situational cards before class using the Construction & Financial Situation Accuracy handout. Pass out cards to students. Students will work independently on the first problem and then get in small groups to talk through the steps they took and the answer they arrived at.

For the construction situation, here are the steps:
- a.) _____ the number of square feet by $15

- b.) Determine how many square feet are in a square yard. Find another corner of your graph paper and mark a 3x3 square. Each square represents a square foot.

- c.) Divide $63 by _____ to determine the price of the carpet per square foot.

- d.) Multiply the area of the new room by _____

- e.) Find the _____ between the two costs

For the financial situation, here are the steps:
- a.   Review the rules for adding and dividing with decimals.

- b. _____ all of the expenses together

- c. _____ amount by the number of people who have agreed to pay

In their small groups, students can develop their own real-life situation, make a card and other groups can complete the work.

Step 7 - Give Operational Accuracy Test on keeping a running checkbook balance. Students who score below 85% must work together to correct their work; then retest with alternative test.

Assessment/Evidence (*based on outcome*)
Teacher observation of students as they work in pairs and small groups, noting accuracy levels of each.
Students will complete a test and will score an 85% or better

Teacher Reflection/Lesson Evaluation
 This lesson has not yet been field tested.

Next Steps
Teacher will continue finding opportunities to remind students of importance of calculation accuracy with more discussion of tolerances in industry and measurements.

Technology Integration
 Math Skills Practice/Consumer Math http://www.ixl.com/math/grade/eighth

Purposeful/Transparent
Teacher provides steps to help students work through given accuracy problems of taxes and drug prescriptions. Teacher and students work

problems together, determining any misunderstandings and adjusting learning.

Contextual
Students find problems in their daily lives (calculating pay checks, paying bills, taking prescription drugs, and construction projects) where accuracy is necessary.

Building Expertise
Students practice accuracy in four basic operations using teacher selected problems and classroom resources and are evaluated for accuracy with the balancing the checkbook task.

Operational Accuracy Worksheet

1.) 203 + 120   2.) 203 – 120   3.) 203 x 120   4.) 203 ÷ 120

5.) $4\frac{2}{5} + 2\frac{3}{4}$ 6.) $4\frac{2}{5} - 2\frac{3}{4}$ 7.) $4\frac{2}{5} \times 2\frac{3}{4}$ 8.) $4\frac{2}{5} \div 2\frac{3}{4}$

9.) 2.107 + 0.54   10.) 2.107 - 0.54   11.) 2.107 x 0.54   12.) 2.107 ÷ 0.54

Complete by yourself or with a friend.

When is Accuracy Important?

What is accuracy and when might it be important? Accuracy comes from the Latin infinitive *accurare* which means to do with care. Accuracy would probably be important with your pay check, the bills, prescriptions, and construction projects.

1.) Suppose you are calculating your income tax obligation. You earned $37,250. The tax rate is $200 plus $3\frac{1}{4}$ % of all money over $20,000 but under $40,000. What do you owe?

What are the steps required to solve this problem?

      a.) Subtract _____

      b.) Rewrite the percent as a _____

      c.) Multiply the difference in step a by _____

      d.) Add _____ to the answer to step c

Work the problem on your own. Do we all agree?

2.) Suppose your daughter is sick, and after an office visit, the doctor prescribed a 342 mg tablet and 0.75 ml of a liquid medication. Because she is sleeping too much, the doctor increases the liquid dose by $\frac{1}{3}$ and reduces the tablet by $\frac{1}{4}$. What will the new dosages measure?

What are the steps required to solve this problem? What do *increase* and *decrease* mean?

      a.) Find $\frac{1}{3}$ of 0.75 and add to _____

      b.) Find $\frac{1}{4}$ of 342 mg and _____

Work the problem on your own. Let's check the work.
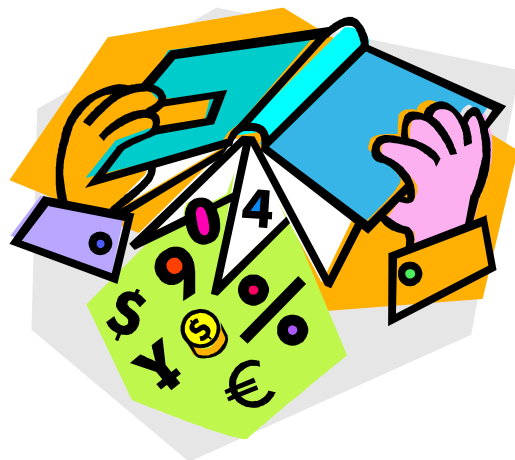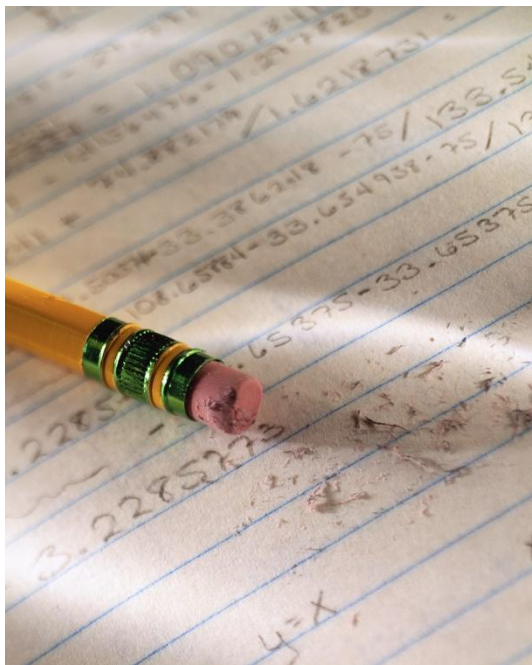
Introductory Decimal Accuracy **Worksheet**

1. To the nearest hundredth of a mile, the diameter of the earth is expressed as 7918.57 miles. Round this number to the following specifications:
a. the nearest whole mile

b. the nearest hundred miles

c. the nearest thousand miles

2. The speed of light is given as 186,284 miles per second. That measurement is given to the nearest_____. To the nearest thousand, the speed of light is _____ miles per second.

3. In a machine shop, a piece of metal is cut with a length of 3.275 inches and a width of 0.750 inches. If the tolerance or deviance from that exact measure is 0.002 inches, what are the upper and lower limits on the machined piece?

4. The tolerance for the diameter of a metal rod is ± 0.005 .
What are the upper and lower limits if the basic dimension is 3.25 inches?

5. Deb's mom paid $36.90 for medicine that she must take three times a day. If there are 90 tablets in the bottle, what is the daily cost for the medication?

6. A shop manager needed 0.21 ounce of platinum for electrical parts he was making. The platinum sells for $1235.63 an ounce. What is his cost for the platinum?

7. Simplify: a.) $2(6+8) - 14 \div 2$ b.) $6\dfrac{3}{4} \div \dfrac{9}{16} =$

c.) $\dfrac{20}{21} \, x \, \dfrac{35}{24} \, x \, \dfrac{18}{56} \, x \, \dfrac{48}{50} \, x \, \dfrac{81}{36} \, x \, \dfrac{28}{27} =$

Accuracy in a Construction Situation

Suppose you've hired a contractor to add a family room onto the back of your house behind the kitchen. The kitchen is 12 feet long and that wall will be shared with the new family room. The new room will also be $12\frac{1}{2}$ feet wide. What would be the perimeter of the new foundation assuming the foundation under the common wall would not be duplicated?

Using graph paper, draw a diagram of the new family room.

Which estimate of the area of the floor space would be large enough to cover the entire floor?

    a.) 25 sq ft   b.) 169 sq ft   c.) 144sq ft

Find the actual number of square feet of area in the new room. What kind of geometric figure is the family room? What formula allows us to find the area of a rectangle?

If carpeting is $63 per square yard and laminated flooring is $15 per square foot, what is the difference in the total price of flooring materials to cover the floor?

Accuracy in a Financial Situation

Suppose you, your brother and four cousins agree to split the expenses for a family reunion. Determine the amount each of you will owe when the expenses are as follows: $175 to rent the facility, $25.85 for drinks, $50.61 for meat, buns, and condiments, and $25.98 for prizes.

Operational Accuracy Test

Your checkbook has a beginning balance of $575.65. Please find the new balance after completing the following:

1. Write a check for $95.50 for the electric bill.

2. Deposit your paycheck of $643.24.

3. Write a check for $625 to pay the rent.

4. Because your electric bill was late you must send a late fee of 1.25% of the last bill. Deduct the penalty from checkbook.

5. You won a bet with your dad, and he gives you one-fourth of the current balance in your checkbook. Add that.

6. You allot one-third of your paycheck for groceries. Subtract that amount.

7. What is the balance in your checkbook now?

Date	Transaction	Balance
9/23/2010		$575.65
9/30/2010		
10/2/2010		
10/2/2010		
10/5/2010		
10/10/2010		
10/15/2010		

Name _____ Date _____